AJBS Asian Journal of Biological Sciences

OPEN ACCESS

Effect of Feed Form and Phytobiotic Blend on Proximate Composition and pH of Rabbit Meat

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ABSTRACT

Background and Objective: Due to the increase in the cholesterol content in the body and diet of humans there is a need to find alternative means of reducing the cholesterol content intake and the objective of this study was to check the effect of feed form and phytobiotic blend on rabbit meat. **Materials and Methods:** A total of forty eight, 7-8 weeks old rabbits were used to determine the effect of feed form and phytobiotics blend on proximate composition and pH of rabbit meat. The rabbits were allotted to four treatments T1-12 rabbits were fed mash diets without the inclusion of blend. The T2-12 rabbits were fed mash diets with 10 g inclusion of blend. The T3-12 rabbits were fed pelletized diets without the inclusion of a blend. The T4-12 rabbits were fed pelletized diets with 10 g inclusion of blend in a 2×2 factorial arrangement. Data were collected proximate composition and pH of rabbit meat. They were analysed using ANOVA. **Results:** Higher ($p<0.05$) high-density lipoprotein was recorded with rabbit-fed mash diet while rabbit-fed pelletized diet had the least. Higher ($p<0.05$) low-density lipoprotein was recorded with the rabbit-fed mash diet while the rabbit-fed pelletized diet had the least. Higher ($p<0.05$) high-density lipoprotein was recorded with rabbit-fed diet without the inclusion of the blend while rabbit-fed diet containing the blend had the least. Higher ($p<0.05$) low-density lipoprotein was recorded with the rabbit-fed diet without the inclusion of the blend while the rabbit-fed diet containing the blend had the least. Higher ($p<0.05$) total cholesterol was recorded with the rabbit-fed mash diet without the blend while rabbit-fed a pelletized diet without the blend had the least. Higher ($p<0.05$) high-density lipoprotein was recorded with rabbit-fed mash diet without the blend while rabbit-fed mash diet containing the blend had the least. Higher ($p<0.05$) low-density lipoprotein was recorded with the rabbit-fed mash diet with the inclusion of the blend while the rabbit-fed pelletized diet containing the blend had the least. **Conclusion:** Feeding diets containing turmeric, garlic, ginger and clove blend can be fed to rabbits in other to reduce the fat and cholesterol content of the rabbit meat which is considered safe for human consumption.

KEYWORDS

Rabbit, phytobiotic, growth performance, carcass yield, feed form

ISSN: 1996-3351 (Print)
https://doi.org/10.3923/ajbs.2023.132.136

Received: 05 Dec. 2022
Accepted: 09 Jun. 2023
Published: 30 Jun. 2023

INTRODUCTION

Meat is a very good source of bioactive compounds which plant sources cannot be replaced with[1]. Protein intake from animal sources is reported to be very low in Nigeria due to the high cost of livestock products resulting from an increase in the cost of feedstuff[2]. Nigerians depend mainly on red meat sources for animal protein supply[3] but this has proved to be grossly unhealthy and directly related to cardiovascular diseases, obesity and some cancer types[4]. These, therefore, necessitate the need to explore healthier and cheaper alternative sources of animal protein such as rabbit. Rabbit meat offers excellent nutritive and dietetic properties with relatively high protein of high biological value and only 7.4% fat[4].

This current study searched the use of phytobiotics blend in place of artificial or synthetic feed additives. Phytobiotics include turmeric (*Curcuma longa*), garlic (*Allium sativum*), ginger (*Zingiber officinale*) and clove (*Eugenol*) which has been proven to perform a series of action such as, anticholesterol, antibacterial, antiseptic, anti-inflammatory, antiparasitic, immunomodulatory[5,6].

However, the using the combination of turmeric, ginger, garlic and clove as natural feed additives in rabbit nutrition has not been investigated. Looking at it from the angle of broad-spectrum antibiotics brought about the use of these four phytobiotics since it has been reported that there are limitations caused by plant species, soil type, location, weather condition, processing and storage that might reduce the potency of active ingredient that can help to improve the meat quality, the four phytobiotics can be used to synergize their actions.

The particle size of feed is a factor that has an impact on digestibility in rabbits. The use of feed forms such as mash, crumbs and pellets are very helpful and important factor in improving meat yield and the health status of the animal. The modification of mash feed will result in pelletized feed[7]. In order to improve performance pelletaized feeding is attributed to preventing wastages of feed and selective feeding and improved palatability which will also have an effect on meat quality[8].

The cholesterol content, chemical composition and meat lipid had considerable effects on the health status of consumers. The use of natural phytogenic materials such as turmeric, garlic, ginger and clove has a positive effect on animal health, increases productivity and improves the quantity as well as the quality of the meat. Hence the need for suitable feed additives to be incorporated into livestock feed and also the form that will be suitable for presentation for animals has arisen in other to produce quality meat.

MATERIALS AND METHODS

The study was conducted at the Rabbitry Unit of the Institute of Food Security, Environmental Resources and the Agricultural Research the Federal University of Agriculture Abeokuta.

Fresh turmeric, garlic, ginger and clove were purchased from Bode Market, Ibadan, Oyo State. Each sample was washed (except garlic and clove) using clean water to remove the dirt completely. They were poured into a clean basket to drain off water and later sliced into flakes in order to increase the surface area to aid drying. Thereafter each of the test ingredients was dried (under the shade) until the weight remains constant. The test ingredients were reduced into the lentil-size part with the aid of a mortar and pestle and milled into fine powdery form with the use of an electric blender following the method described by[5]. Thereafter it was sieved and stored in an airtight container until use.

A total of forty-eight, 7-8 weeks old crossbreed rabbits were used for the study and 2.5 g of turmeric, 2.5 g of garlic, 2.5 g of ginger and 2.5 g of clove combination of all this to form 10 g of the blend. The animals were purchased from a reputable farm and were acclimatized for two weeks. They were weighed and allotted to 8 treatments on an equal weight basis in a 2×2 factorial arrangement comprising of the

blend (with and without) of rabbits and feed form (mash and pellet). Treatment T1-12 rabbits were fed mash diets without the inclusion of blend. The T2-12 rabbits were fed mash diets with 10 g inclusion of blend. The T3-12 rabbits were fed pelletized diets without the inclusion of a blend. The T4-12 rabbits were fed pelletized diets with 10 g inclusion of blend. Each treatment had 8 replicates of 2 rabbits each. Before stocking, the pen was cleaned thoroughly and disinfected. The animals were fed with an experimental diet containing 16.59% Crude Protein (CP) and 10.53 MJ/kg Metabolizable Energy supplemented in the mash and pelletized form. Feed and water were supplied *ad libitum* daily. All other routine management practices will be observed. The feeding trial lasted for 10 weeks. Data collected were analysed using ANOVA as contained in SAS (2002) Significant means were separated using Duncan Multiple Range Test as contained in SAS (2002). After 10 weeks of the experiment, three animals per treatment were slaughtered and 200 g of meat was taken to the lab for proximate analysis and pH.

RESULTS

The main effect of feed form on proximate composition and pH of rabbit-fed diets containing turmeric-garlic-ginger-clove blend in mash and pellet form was shown in Table 1. Significant ($p<0.05$) differences were obtained between high-density lipoprotein and low-density lipoprotein. The highest ($p<0.05$) high-density lipoprotein (36.04 mg) was recorded with the rabbit-fed mash diet while the rabbit-fed pelletized diet had the least (32.02 mg). Highest ($p<0.05$) low-density lipoprotein (22.07 mg) was recorded with rabbit-fed mash diet while the rabbit-fed pelletized diet had the least (17.17 mg). No significant ($p>0.05$) difference were recorded on dry matter, moisture content, ash, crude fat, crude protein, total cholesterol and pH.

Table 2 shows the main effect of blend on proximate composition and pH of rabbit-fed diets containing turmeric-garlic-ginger-clove blend in mash and pellet form. Significant ($p<0.05$) differences were obtained with high-density lipoprotein and low-density lipoprotein. The highest ($p<0.05$) high-density lipoprotein (36.43 mg) was recorded with a -rabbit-fed diet without the inclusion of the blend while rabbit-fed diet containing the blend had the least (31.63 mg). The highest ($p<0.05$) low-density lipoprotein (21.41 mg) was recorded with a rabbit-fed diet without the inclusion of the blend while the rabbit-fed diet containing the blend had the least (17.82 mg). No significant ($p>0.05$) differences were recorded on dry matter, moisture content, ash, crude fat, crude protein, total cholesterol and pH.

Table 3 shows interaction between feed form and blend on proximate composition and pH of rabbit-fed diets containing turmeric-garlic-ginger-clove blend in mash and pellet form. Significant ($p<0.05$) differences were obtained in total cholesterol, high-density lipoprotein and low-density lipoprotein. The highest ($p<0.05$) total cholesterol (70.99 mg) was recorded with rabbit-fed mash diet without the blend while rabbit-fed pelletized diet without the blend had the least (57.35 mg). Highest ($p<0.05$) high-density

Table 1: Main effect of feed form on proximate composition and pH of rabbit-fed diets in mash and pellet form

Parameter	Mash	Pellet	SEM	p value
Dry matter (%)	0.33	0.36	0.02	0.46
Moisture content (%)	67.15	63.90	1.87	0.46
Ash (%)	1.22	0.79	0.12	0.07
Crude fat (%)	4.55	5.09	0.27	0.34
Crude protein (%)	17.56	18.19	0.59	0.63
Crude fibre (%)	0.02	0.07	0.01	0.13
Total cholesterol (mg)	65.75	63.14	2.56	0.38
HDL (mg)	36.04[a]	32.02[b]	1.33	0.03
LDL (mg)	22.07[a]	17.17[b]	1.72	0.0001
pH	2.82	3.22	0.19	0.28

[ab]Means in the same row with different superscripts differ significantly ($p<0.05$), HDL: High-density lipoprotein and LDL: Low-density lipoprotein

Table 2: Main effect of blend on proximate composition and pH of rabbit-fed diets containing turmeric-garlic-ginger-clove blends

Parameter	Without	With	SEM	p value
Dry matter (%)	0.37	0.32	0.02	0.33
Moisture content (%)	63.31	67.74	1.87	0.33
Ash (%)	1.04	0.97	0.12	0.74
Crude fat (%)	5.21	4.44	0.27	1.19
Crude protein (%)	18.70	17.05	0.59	0.22
Crude fibre (%)	0.05	0.05	0.01	1.00
Total cholesterol (mg)	64.17	64.72	2.56	0.85
HDL (mg)	36.43[a]	31.63[b]	1.33	0.02
LDL (mg)	21.41[a]	17.82[b]	1.72	0.0001
pH	2.89	3.14	0.19	0.49

[ab]Means in the same row with different superscripts differ significantly ($p<0.05$), HDL: High-density lipoprotein and HDL: Low-density lipoprotein

Table 3: Interaction between feed form and blend on proximate composition and pH of rabbit-fed diets containing turmeric-garlic-ginger-clove blend in mash and pellet form

Parameter	Mash/without	Mash/with	Pellet/without	Pellet/with	SEM	p value
Dry matter (%)	0.33	0.33	0.40	0.32	0.02	0.33
Moisture content (%)	67.11	67.18	59.51	68.29	1.87	0.33
Ash (%)	1.15	1.29	0.93	0.65	0.12	0.34
Crude fat (%)	4.60	4.50	5.82	4.37	0.37	0.24
Crude protein (%)	17.72	17.40	19.68	16.70	0.59	0.32
Crude fibre (%)	0.03	0.01	0.06	0.08	0.01	0.45
Total cholesterol (mg)	70.99	60.51	57.35	68.93	2.56	0.004
HDL (mg)	41.49	30.58	31.37	32.67	1.33	0.004
LDL (mg)	20.52	23.62	22.31	12.02	1.72	0.0001
Ph	2.61	3.26	3.18	3.26	0.19	0.64

HDL: High-density lipoprotein and LDL: Low-density lipoprotein

lipoprotein (41.49 mg) was recorded with the rabbit-fed mash diet without the blend while rabbit-fed mash diet containing the blend had the least (30.58 mg). Highest ($p<0.05$) low-density lipoprotein (23.62 mg) was recorded with rabbit-fed mash diet with the inclusion of the blend while the rabbit-fed pelletized diet containing the blend had the least (12.08 mg). No significant ($p>0.05$) differences were recorded on dry matter, moisture content, ash, crude fat, crude protein and pH.

DISCUSSION

The high-density lipoprotein and low-density lipoprotein were higher in rabbit feed mash feed and this might be a result of feed form because the mash feed had higher fat content when compared to the pelletized feed that as go through the process of drying that will lead to the reduction in the high and low level lipoprotein content of the meat. Inspect of the level of significance recorded the value still falls within the value recorded by Zotte and Szendro[9]. The pH value also falls within the range of 6 or lower which is considered safe, while higher values are considered unsuitable for eating[10].

The result showed that the value of high-density lipoprotein and low-density lipoprotein of the rabbit-fed diet containing the blends is lower than the once fed diet without the inclusion of the blend and this is as a result of the effect of the blend. This was in agreement with the report of researchers[11-13], who reported that the blend used in this study helps to lower the level of cholesterol in the meat and serum cholesterol. The pH value also falls within the range of 6 or lower which is considered safe, while higher values are considered unsuitable for eating[11].

The list value was recorded with the rabbit-fed diet containing the blend which is in agreement with the report of researchers[11-13], who reported that the use of blend serves as anti-cholesterol and helps to lower the effect of low-density lipoprotein in the meat. The means blend and feed form had no detrimental effect on rabbit meat proximate composition because the value falls within the value reported by 15 and pH values also fall within the range as reported by Hanieh *et al.*[11] which considered it safe for consumption.

CONCLUSION

Phytobitic blend and feed form had no detrimental effect on proximate composition and pH. Feeding diets containing turmeric, garlic, ginger and clove blend can be fed to rabbits in other to reduce the fat and cholesterol content of the rabbit meat.

SIGNIFICANCE STATEMENT

Due to increase in the report of the incidence of high cholesterol in the intake of human both in food and meat they consume this study was carried out in other to check the effect of phytobiotics blend and also the mode of acceptability and effectiveness of the blend in terms of the feed form (mash and pelletized feed) to know maybe it will reduce the cholesterol and content of the meat of rabbit in other to be able to make specific recommendation. The key findings include that the inclusion of the pyhtobiotic blend in the diets of the rabbits helps to reduce the fat and cholesterol content of the meat which is considered safe for human consumption.

ACKNOWLEDGMENT

I will like to appreciate the co-authors for the assistance rendered throughout the experiment.

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